

Transforming Traditional Business Models through Disruptive Technology

An Honors Thesis (HONR 499)

by

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A handwritten signature in black ink, enclosed within a hand-drawn oval. The signature is stylized and appears to read 'Fred Kitchens'. To the right of the oval is a small, separate handwritten mark that looks like a 'C'.

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Contents

Abstract 3

Acknowledgements 4

Introduction 5

Background 6

Disruptive Technology 6

E-commerce 7

The Value Chain 8

The Supply Chain 10

Crowdsourcing as a Result of Web 2.0..... 13

Body 15

The Traditional Model 15

Automation of Value Chain Activities 17

Inbound and Outbound Logistics..... 19

Operations 20

Sales & Marketing 21

Service..... 22

Human Resources 23

Procurement 23

Disintermediation of the Supply Chain..... 24

Customersourcing 26

Future Direction 34

Conclusion 36

Works Cited 37

Abstract

The application of disruptive technologies to business processes has given rise to a new generation of business models. Three of the disruptive technologies discussed in this paper are software, the Internet, and Web 2.0. Businesses that implement these technologies are able to automate value chain activities, disintermediate their supply chains, and benefit from customer contributions. Each of the disruptive technologies and their application has implications for the firm's value chain and supply chain, and leads to a new e-commerce model incorporating a new term, *customersourcing*. Customersourcing is a term coined as a subcategory of crowdsourcing and a method of eliciting contributions from a firm's customers. This paper considers the implications of each technology in sequence, with each step resulting in a change in the supply chain and/or the value chain. The culmination of these changes is an e-commerce model that relies on customersourcing to provide certain business functions of both the supply chain and the value chain.

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Introduction

The evolution of technology has spurred new ways for businesses to perform their processes, and in many cases, new business models altogether. One general trend is that businesses are increasing their online presence. Because of the Internet, e-businesses now exist, which allow for an entirely new and direct way to interact with customers. The Internet is one example of a disruptive technology that has enabled businesses to change the way they operate, but others abound. Businesses utilizing the Internet not only become more efficient and responsive; they have changed the way that they fit into their supply chain and execute their value chain activities.

Disruptive technologies such as the internet are changing the way businesses operate. Some applications of disruptive technology are confined to particular business functions, whereas others have implications for the entire value chain and/or supply chain. This paper looks at the relationship between the supply chain and the value chain and applies disruptive technologies to them. The implications of each technology will be considered in sequence, with each step requiring a change in the modeling of the supply chain and/or the value chain.

The first part of this paper establishes foundational concepts to be considered as they apply to the impact of disruptive technologies on business models. These concepts include a definition of disruptive technology, a description of e-commerce, an introduction to the value chain and supply chain, and a description of crowdsourcing. The second part of the paper applies automation, the Internet, and Web 2.0 to value chain and supply chain models. The paper ends by coining the term *customersourcing* as a subcategory of crowdsourcing and a method of eliciting contributions from a firm's customers.

Background

The foundation of this research is based on four basic concepts: disruptive technology, e-commerce, the value chain, and the supply chain. Before considering how disruptive technologies have changed supply chains and value chains, each of the basic concepts will be introduced and explained.

Disruptive Technology

A disruptive technology is a technological change that displaces established technologies (Danneels, 2004). It often results in incumbent businesses, which are still using established technology, being replaced by new market entrants (Danneels, 2004). Disruptive technologies cause traditional business practices and models, which relied on established technology, to become either obsolete or restructured. The specific disruptive technologies that this paper examines are software, the Internet, and Web 2.0.

Due to the difficulty of adapting traditional models to new technology, it becomes easier for entrant firms that are using disruptive technology to take market share from incumbent businesses (Danneels, 2004). For example, the commercial use of the Internet resulted in an explosion of dot-com companies being formed, and eventually the proliferation of Web strategies in many industries (Laudon, 2012). Firms that were unable to capitalize on the new technology suffered at the hands of those that could. Barnes & Noble is an example of a company that has become less competitive because of its inability to capitalize on the Internet. Instead, it relied on established practices, like selling solely through brick and mortar stores. The

upheaval of business practices because of disruptive technology also means that traditional ways of modeling supply chains and value chains are no longer always relevant.

E-commerce

Many of the businesses that have realized significant changes in their supply chains and value chains have been a part of the evolution of the web as a tool for business. This practice is termed e-commerce, and it is quite simply defined as the use of the Internet and the World Wide Web to transact business (Laudon, 2012).

Businesses can deploy two different types of web strategies: an informational/communicational strategy and an online/transactional strategy (Goi, 2007). The information/communicational strategy is “for companies to use the Web as a supplement to traditional marketing, delivering additional benefits to customers and building relationships with them” (Goi, 2007). The online/transactional strategy, on the other hand, is “for companies to use the Web to construct ‘virtual business’ - independent, profitable ventures that exist only on the Internet” (Goi, 2007). This paper and the models it puts forth are most applicable to businesses that are using an online/transactional strategy. Several types of e-commerce business models exist within this strategy, including: portal, e-tailer, content provider, transaction broker, market creator, service provider, and community provider (Laudon, 2012).

Disruptive software, the Internet, and Web 2.0 play roles in most e-commerce businesses. Amazon is an example of a company that utilizes the e-tailer model, a model that uses the Internet to sell goods directly to customers. Market creator models, like the one that eBay uses, are another common model for e-commerce that rely on the internet as well. Community providers, yet another model, rely on users to create value for their site, often by using the site as

a social network. Community providers such as Facebook, LinkedIn, and Match.com all make use of Web 2.0 technologies. The emergence of e-commerce businesses is correlated with the implementation of disruptive technologies such as the software, the Internet, and Web 2.0.

The Value Chain

The value chain is a model that describes a series of value-adding activities connecting a company’s supply side with its demand side (Rayport & Sviokla, 1995). This paper considers how the application of software and Web 2.0 technologies to businesses affect their value chains. Figure 1 depicts the value chain activities introduced by Michael Porter (1985).

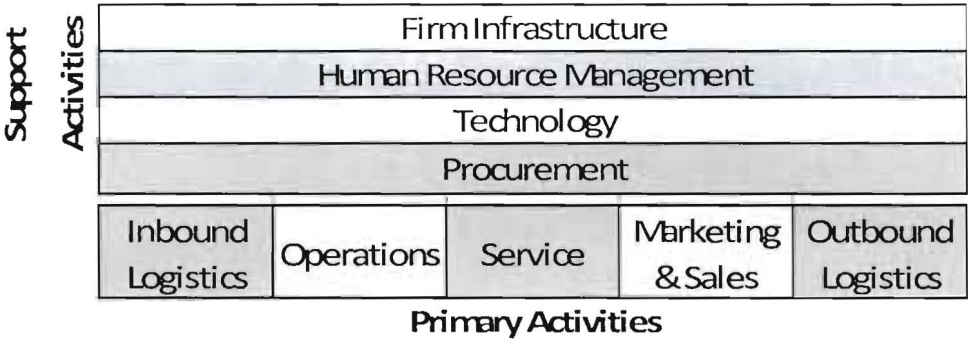


Figure 1: *Value Chain Activities*

Although the scope of the value chain sometimes spans an entire industry, what is considered in this paper is the *internal* value chain. This value chain exists within each entity in the supply chain, as opposed to across multiple entities. Analyzing the value chain helps businesses identify the ways in which they create value for customers and how to maximize it (“Value Chain Analysis: Achieving Excellence in the Things That Really Matter,” n.d.).

The application of software, especially intelligent software, to value chain activities has constituted a disruptive technology for many businesses. Businesses have used the rapidly

expanding abilities of software to their advantage by automating their business processes. Traditionally, the firm's employees controlled all of the value chain activities, but now their work is being distributed to automation. Increased efficiency and cost-effectiveness are two outcomes of automation that are motivating firms to increase software's influence over the execution of value chain activities.

The automation of value chain activities is nothing new, but it has grown in both scale and in complexity. The first aspect to note of the move toward automation is that businesses are automating across an increasing number of business functions, so that software handles or impacts a larger number of business functions. Software is able to automate more business functions and value chain activities than ever before, diminishing the need for paying humans to perform manual tasks. Wiseman et al. (2013) argue that human jobs are increasingly being lost to their machine counterparts. Some of the examples include machines doing the work of librarians, secretaries, train conductors, utilities workers, meter readers, and cashiers (Wiseman et al., 2013). This change is due to a few factors: the relative low cost of using machines to perform business functions rather than humans, the sheer quantity of information being processed by companies, cloud computing, and smarter machines (Wiseman et al., 2013).

Software has evolved from handling menial and repetitive tasks on the manufacturing floor to emulating the decision-making roles that have traditionally been executed by upper levels of management. Advancements in the field of artificial intelligence have shown that automating beyond the lowest level of employees in a company's hierarchy and into the upper levels of management, where strategic goals need to be solved, is not unrealistic. Even today, while software is still several notches below the level of human sentience, it has huge implications for the way businesses create value for their customers. Business process

automation and workflow automation are areas that will be discussed in more detail. Briefly, they are “the technology-enabled automation of activities or services that accomplish a specific function or workflow” (Rouse, n.d.).

The Supply Chain

The supply chain is a conceptual model to show how goods and information flow from a supplier to an end customer. Supply chain models are relevant for non-physical and physical products alike, since the supply chain can be defined as the flow of *information* and material to and from suppliers and customers (Kathawaia, 2003). A traditional supply chain model, based on supply chain descriptions by Harland (1996), is depicted in Figure 2.

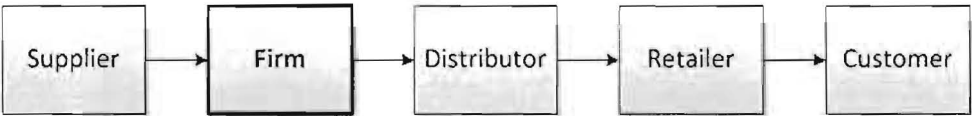


Figure 2: Traditional Supply Chain

Like the value chain, the supply chain has been subject to disruptive technologies. In this paper, the supply chain model will be modified to demonstrate the impact of the applying software, the Internet, and Web 2.0 technologies to firms.

The concept of a supply chain is relevant whenever there exists a set of entities involved in the design of new products and services, procuring raw materials, transforming them into semifinished and finished products, and delivering them to an end customer (Swaminathan, 2003). Given this description, supply chain concepts are most readily obvious in the manufacturing industries, where there is a clear input of raw materials, a value adding process that transforms them into products, and the distribution of said products to customers. The manufacturing industry lends itself to the characteristics of most traditional supply chain models

because it aligns with the way in which these models typically depict the value-creating process. Specifically, they delimit the stages in the process by segmenting the chain into physically and functionally distinct entities. For example, there is often a clear distinction between which entity produces raw materials and which entity begins transforming them into a product.

One of the key assumptions of the model in Figure 2 is that the value chain activities, which are internal to each entity, are entirely controlled and executed by that entity itself. Traditional supply chain models are comprised of multiple entities that effectively form silos of segmented processes. The application of disruptive technologies, though, allows firms to interact with the other entities in their supply chain in an entirely different way.

Also common in traditional supply chain modeling is work passing through each of the silos laterally and unidirectionally (left to right), so that once an entity hands off a piece of work it cedes control and involvement with the work for the rest of the work's movement through the chain. Traditionally, the only exception that is usually allowed for unilateral movement is when a product is returned from the most immediate downstream member of the supply chain. Otherwise, it is apparent that the supply chain entities are not integrated. The supply chain model displayed in Figure 2 is a good example of the traditional modeling technique for supply chains, wherein there are distinct elements as well as a unidirectional movement from left to right.

The blending of the lines between different entities in the supply chain on a scale larger than just customer returns has already been suggested as a direction for the future of supply chains. Mark Nissen (2001) asserts that "the integration of buyer and seller supply chain processes is critical for speed and responsiveness in today's hypercompetitive product and

service markets.” Increasingly, an entity in a supply chain is aware of what happens not just one step down the supply chain, but several steps. New technologies like the Internet have allowed producers to eliminate the steps between themselves and end-customer. This is one of the reasons that traditional supply chain models are no longer always applicable to firms.

Just as software is a disruptive technology with implications for the value chain, the Internet is a disruptive technology with implications for the supply chain. The Internet has aided in the collapse of the barrier of middlemen between producers and consumers. Interfacing directly with end customers as opposed to going through intermediaries is labeled disintermediation, and is formally defined as the “displacement of market middlemen who traditionally are intermediaries between producers and consumers by a new direct relationship between manufacturers and content originators with their customers” (Laudon, 2012). There are some compelling reasons for a business to pursue a more direct line of information sharing and transactions with its customers. One reason is that it gives producers the potential to increase their profit margin and/or decrease the price for customers by eliminating the costs associated with selling to end customers through intermediate profit-seeking businesses. Other benefits of disintermediation are the quick movement of products from producer to consumer and an increased control over the supply chain.

The Internet is often the key for disintermediating a supply chain. Websites allow customers to access a company’s products and other information coming directly from the company itself, rather than being filtered and distorted by multiple steps in the supply chain. Likewise, companies are able to receive information from their customers that they might otherwise not have gotten. Customer information might have otherwise been diluted and less relevant because of its travel through intermediaries.

An example of disintermediation can be seen in what happened to the travel industry. Traditionally, brick-and-mortar travel agents served as an intermediary between hotels and airlines and people who wanted to plan trips. The agents played the important function of aggregating information from multiple sources and customizing it for a customer. With the advent of the Internet, however, customers are able to access the same information directly from airlines and hotels. Newspapers and other printed publications are another example of businesses that are eliminating the costs of intermediaries by making their content directly accessible to consumers online. Like these examples, instances of disintermediation are most typically found in the creation of virtual marketplaces using the Internet. The Internet creates a virtual business platform on which suppliers and customers can interact without going through other channels on the supply chain. Disintermediation causes a significant departure from traditional supply chain models that usually account for intermediaries such as distributors and retailers.

Crowdsourcing as a Result of Web 2.0

The Internet has led to a third disruptive technology called Web 2.0. Web 2.0 is a more user focused stage in the development of the web that has implications for both the value chain and the supply chain. It supersedes the predominantly published model of many web-based information applications and services and allows information services to become more dynamic (Tredinnick, 2006). Instead of users of the Internet viewing published and static content, they are being interactive and contributing. This type of an interface has enabled users of web pages to play a new type of role in many businesses.

As a result of Web 2.0 technologies, businesses are now able to reach beyond the employees within their company walls to complete business functions. Crowdsourcing is “a new web-based business model that harnesses the creative solutions of a distributed network of individuals through what amounts to an open call for proposals” (Brabham, 2008). Websites such as *InnoCentive* have emerged as platforms for crowdsourcing, which serve as a virtual marketplace between businesses and a great number of potential problem-solvers. *InnoCentive*’s expressed purpose is to be a “global leader in crowdsourcing innovation problems to the world’s smartest people who compete to provide ideas and solutions to important business, social, policy, scientific, and technical challenges” (InnoCentive, n.d.). The implications of crowdsourcing can extend beyond information products, however, and do not always necessitate a third party. Crowdsourcing can be utilized by companies producing physical products as well (Von Hippel, 2005). Von Hippel (2005) argues that, “a growing body of empirical work shows that users are the first to develop many and perhaps most new and industrial consumer products.” Much of the case for crowdsourcing rests on the notion of wisdom of the crowd, which is the finding that the aggregate of a set of proposed solutions from a group of individuals performs better than the majority of individual solutions (Yi, 2012). In other words, the crowd is capable of providing solutions superior in quality and quantity to those that traditional forms, such as Research and Development teams, of business can provide (Brabham, 2008).

Web 2.0 and crowdsourcing have had implications for both the value chain and the supply chain. Crowdsourcing has significant implications for a business’ value chain because customers may play a critical role across all its operations (Chafkin, 2008). Web 2.0 and crowdsourcing impact the supply chain by changing the way that firms and customers interact with each other.

Body

The application of disruptive technologies to businesses can be traced through a progression of value chain and supply chain models. First, a model that incorporates both the supply chain and value chain is introduced. Second, the impact of automation on value chain activities is considered. The third section models the impact of disintermediation on the supply chain. The fourth and final section coins the term “customersourcing” and explains its impact on both the value chain and the supply chain.

The Traditional Model

The supply chain and the distribution of value chain activities of a firm before the application of disruptive technologies is depicted in Figure 3. It is a model that merges the traditional supply chain and value chain models that were introduced earlier. The value chain portion of Figure 3 is laid out slightly different in order to help visualize the distribution of value chain activities. Traditionally, though, all of the firm’s value chain activities are handled by the firm’s employees.

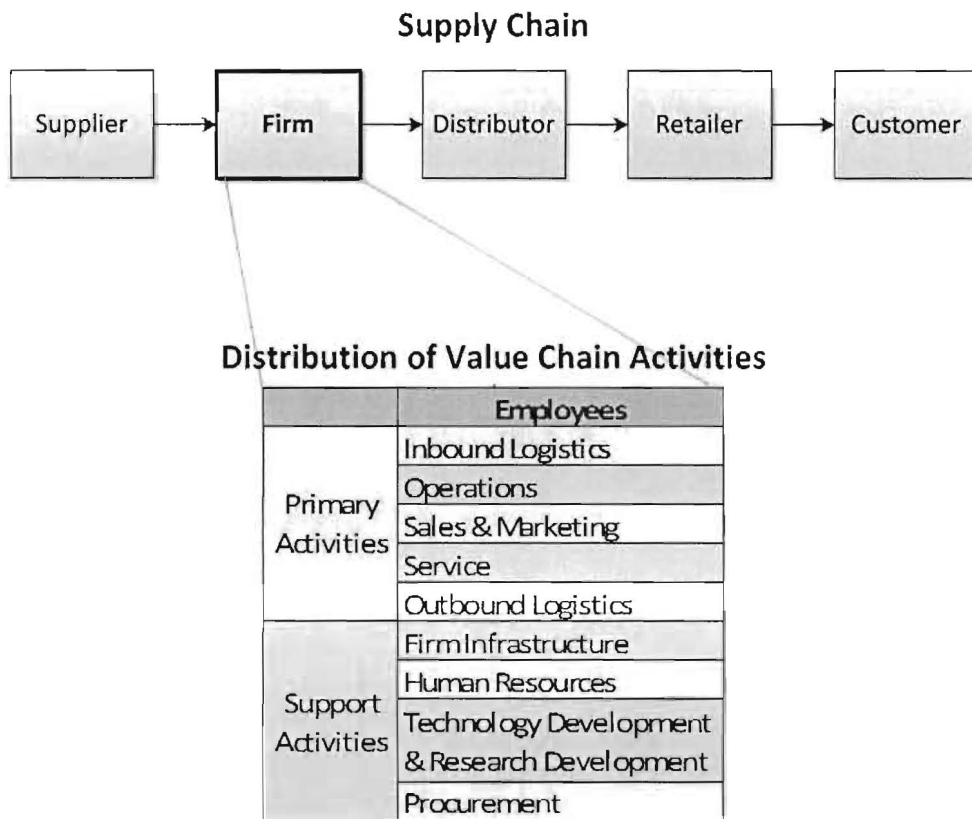


Figure 3: The Traditional Supply Chain and Value Chain

The firm serves as the focal point for this paper’s discussion. The firm is the entity that applies disruptive technologies in order to disintermediate, automate, and crowdsource. The value chain that is depicted in Figure 3 represents the internal value chain of the firm, which is comprised of the value-adding activities between the firm’s supply side and demand side. Movement of these activities in later models indicates that the activity has either been distributed to, or completely ceded to, another resource of the firm. The emerging trend is that the firm is able to utilize employees less; the cheaper, more efficient automation technologies and crowdsourcing resources are being used more, which can have implications beyond just the cost and efficiency of the company.

Automation of Value Chain Activities

The first departure from Figure 3 to consider is using software to automate value chain activities. This is depicted in Figure 4.

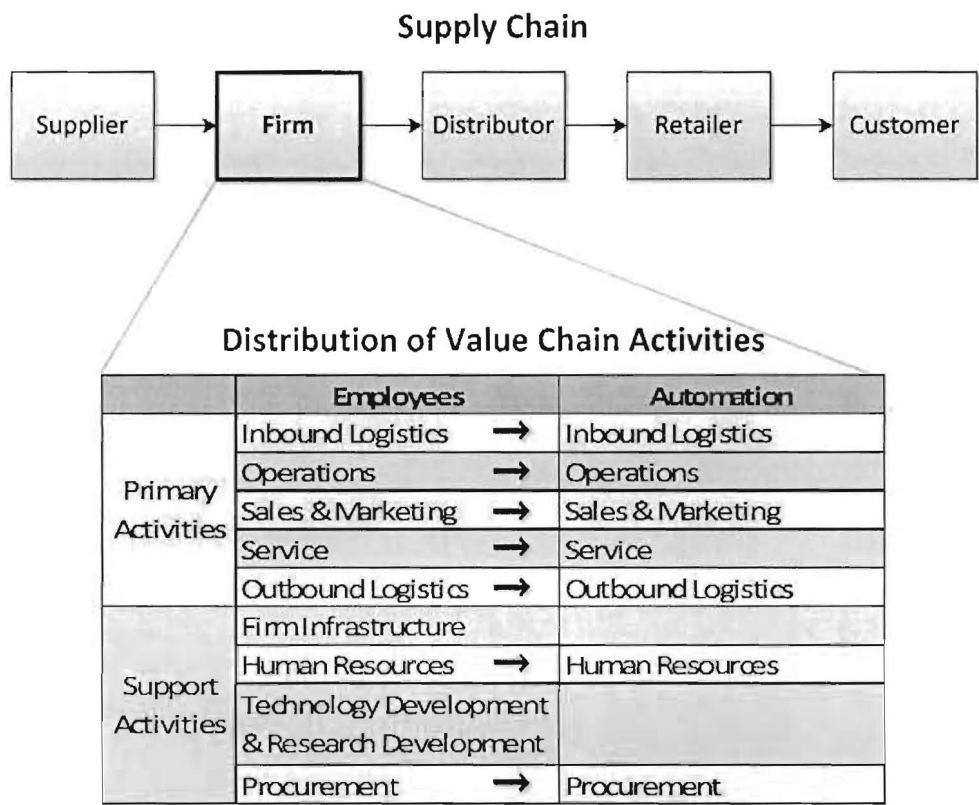


Figure 4: Supply Chain and Value Chain Models after Automation

The supply chain has been a target for increased automation over the past few decades. Normally, an increase in automation results in a reduction in human input and output. Supply chain hardware, software, and processing solutions have all been heavily automated (“Automation Grows, But We Still Need People”, n.d.). With automation, the modeling of the supply chain is kept intact, even though the way entities of the chain interact with each other changes. The distribution of the value chain activities, on the other hand, constitutes a change

from the distribution depicted in Figure 3. Specifically, Automation moves some of the value chain activities away from employees.

The first impact of automation to be considered is on the supply chain. In the spirit of integration, businesses are starting to reengineer their supply chain processes to improve efficiency and accuracy through the use of software “agents” that are responsible for many of the activities across the supply chain. Although these theoretical agents are ultimately software, they are in a class different from the common supply chain management tools such as Enterprise Resource Planning. An agent is an autonomous, goal-oriented software process that operates asynchronously, communicating and coordinating with other agents as needed (Fox et al., 2000). Intelligent agent technology offers the potential to overcome many limitations of current supply chain technologies because it collaborates with other parts of the supply chain and makes strategic decisions on an unprecedented level (Nissen, 2001). Fox et al. (2000) helped establish the argument for software agents managing a supply chain by offering solutions for agent-based software architecture. The movement toward using software agents as the locus for decision-making and supply chain integration encompasses the increase in the automation of businesses. Although automation and Figure 4 do not signify a change in supply chain structure, software agents have huge implications for how firms interact with the other entities in their supply chain.

The next considerable impact of automation is the one that it has on the value chain. Business Process Automation (BPA) is the “technology-enabled automation of activities or services that accomplish a specific function or workflow” (Rouse, n.d.). The automation of business processes and workflows has benefits that include allowing for optimum efficiency in delivering information, ensuring completion of transactions, tracking the efficiency of processes,

and providing positive returns to the company (Love-Sudduth, 1997). Besides these, automating value chain activities has the inherent benefit of taking work off of the hands of employees. The automation of activities does not always result in the elimination of employee involvement entirely from a given value chain activity, but it is often able to complete time-consuming tasks more quickly and more efficiently than humans. This leaves the remaining employee involvement lessened and in more strategic and critical roles.

The value chain activities that have been distributed to automation include logistics, operations, sales and marketing, service, human resources, and procurement. Automation spans many different value chain activities as well as many different industries. IBM, for example, offers business process automation solutions for industries including banking, energy, energy & utilities, government, healthcare, insurance, retail, and telecom (IBM, n.d.). The following sections describe how some activities of the value chain have been automated.

Inbound and Outbound Logistics

One of the value chain activities that is redistributed by automation is logistics. Inbound logistics involves the activities of receiving, storing, and disseminating incoming goods or material for use; outbound logistics activities are required to transfer the finished products to the customers via warehousing, order fulfillment, transportation, and distribution management (Saha, 2012). Inbound and outbound logistics typically occur in a similar environment and involve similar resources and activities. Both activities can use automation to accomplish tasks such as moving materials, sorting, packaging, and storing. Another applications of automation to inbound and outbound logistics is data collection. Radio-frequency identification (RFID) is an example of this. RFID is among technologies such as barcodes, biometrics, machine vision,

magnetic stripe, optical card readers, voice recognition, and smart cards that are used for automated data collection to augment enterprise resource planning or ERP system activities (Angeles, 2006). It works by tagging objects with a microchip and a small antenna, which can send unique information about the object to computers once it is scanned. RFID technology can also facilitate inter-organizational e-commerce initiatives such as continuous replenishment or vendor-managed inventories (Angeles, 2006).

Another example of automation being used in logistics activities is the use of robots to assist with material handling. As a part of the movement towards automation, “many companies are turning to mobile robotic systems such as the ones offered by Kiva and Swisslog, which contrast sharply with traditional warehouse picking models. Instead of warehouse workers going to find the product, the product comes to the workers” (Partridge, n.d.). This is usually accomplished by robots transporting materials and products around the facility to stationary workers, a more efficient and less human-intensive approach than having employees performing all manual tasks.

Operations

Operations is another value chain activity that has been transformed by the use of automation. It is difficult to generalize the way in which automation has been applied to operations, given its breadth and how much it differs between firms. In general terms, operations can be described as the production process, development activities, testing, packaging, maintenance, and all other activities that transform the inputs into finished product (Saha, 2012). Automating operations has a similar effect to automating all other areas of the firm; it reduces involvement of employees, which achieves greater efficiency, reduces human errors, and

produces at a higher quality. One of the easiest places to see the impact of automation is in manufacturing. In fact, automation has cut direct labor to a smaller fraction of production costs (Moriarty & Swartz, 1989). Levary (1994) argues that “a manufacturing system is said to be automated if it is to some degree self-acting, self-regulating, and self-dependent. The less dependent a manufacturing system is on a human operator, the higher its degree of automation.” Distributing manufacturing activities is in the firm’s interest because it leads to consistent quality, lower unit production costs, and higher productivity (Levary, 1994).

Sales & Marketing

The value chain activity of sales and marketing is likewise being increasingly handled by automation. The benefits of automation are occurring more frequently as “forward-looking companies install marketing and sales productivity systems that automate routine tasks and gather and interpret data that was either scattered or uncollected before. These networks not only upgrade the efficiency of the sales and marketing staffs but also improve the timeliness and quality of marketing and sales executives' decision making because of the use they can make of the data collected and analyzed” (Moriarty & Swartz, 1989). The work being automated can consist of that of a single salesperson, a single marketing activity, or a company's entire marketing and sales operation (Moriarty & Swartz, 1989). A concept linked to the automation of sales and marketing in the value chain is Sales Force Automation (SFA). SFA involves using software to automate the business tasks of sales. These tasks include order processing, contact management, information sharing, inventory monitoring and control, order tracking, customer management, sales forecast analysis and employee performance evaluation. One common example of automating a sales activity is when a company utilizes payment processing

technologies such as Paypal. Paypal, like many other automation technologies, has been enabled by the internet and the growing number of e-commerce businesses. Another automated approach for making a sale is pizza restaurants giving customers the option to order their food online. The customer is able to browse options, submit an order, and provide payment information. Even telemarketing can serve as an example of how a firm can use automation in its marketing and sales activities.

Service

Service activities in the value chain, despite being one of the most customer-facing facets of a firm, have proven capable of being at least partially automated. For example, companies can now interface with customers through voice technologies when a customer calls a number that is answered by a machine. Often times, the machine may be able to provide the information that a caller is looking for or allow the caller to trigger a change in something such as the status of their account, without involvement of an employee. Examples of this type of automated interaction are readily available, such as when customers call a number to check the status of their mobile phone account and their minutes usage. A lot of email interaction with customers is automated as well. Consider the impact of being able to generate an email to newly registered users of a website automatically, as opposed to having the emails sent manually by employees. Many customer service activities, such as these, are able to be performed in the absence of internal employee involvement.

Human Resources

Automating human resources can be helpful for tracking hours, managing salaries, enforcing rules, training, and more. One very apparent application is within workforce management. Specifically, many firms have time-keeping and employee scheduling software, so that internal HR employees don't have to spend a great deal of time manually documenting time cards and requests for time off. Along the same lines, firms can now utilize direct deposit, where employee payment is sent automatically and electronically to their bank accounts instead of paychecks having to be printed and distributed. Another example of human resource automation is that firms are sparing lots of internal employee involvement in application and onboarding processes by utilizing the Web. Applicants can submit all of their information online and even be screened by software. This saves employees from manually reviewing every application submission. Additionally, once an applicant is hired, information needed for taxes and other company requirements can be collected entirely on the Web and on the applicant's time and without transcribing errors.

Procurement

A final automated value chain activity to consider is procurement. This basically involves the purchasing of inputs for the firm. Automated procurement activities include: spend analysis, which helps companies aggregate, classify, cleanse, and analyze their supplier spend information; eSourcing, which automates the sourcing or bid process; contract management, which automates the supplier contracting process; eProcurement, which automates the requisition to purchase order process; and ePayables, which automates the accounts payable

process (Bartolini, 2012). These automations, like the rest of the automations across the value chain, offload work from employees, thereby decreasing costs and increasing efficiency.

Disintermediation of the Supply Chain

The application of the Internet to businesses has disintermediated supply chains. Disintermediation creates a direct interface between the firm and its end customers. In contrast to the previous discussion of automation, in which the distribution of value chain activities was the area primarily affected, disintermediation has a direct impact on the structure of the supply chain. It has consolidated the supply chain to the point that there exists a direct connection between the firm and the end customer. Disintermediation of the supply chain is depicted in Figure 5.

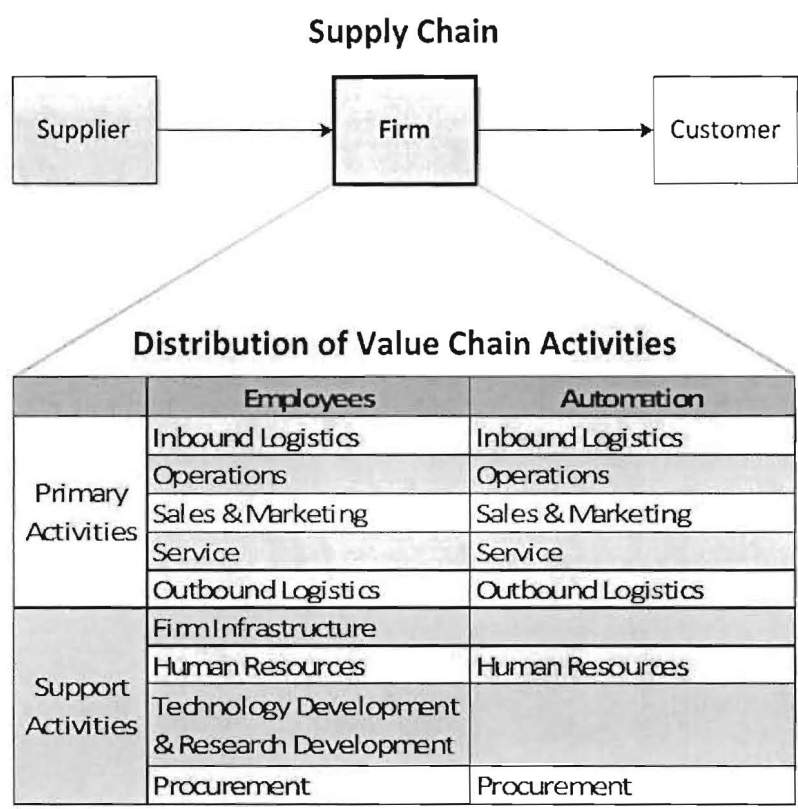


Figure 5: Supply Chain and Value Chain Models after Automation and Disintermediation

Disintermediation offers several benefits to both the firm and its customers. Some of these include: cost reduction; remaining competitive with other firms that have disintermediated; improving value through things such as increased customization opportunities and more current inventory; forming relationships with customers; reducing time between production and the end customer; and more rapid adaptation to demand.

The most important aspect of the Internet, in terms of supply chain disintermediation, is the World Wide Web. Firms can now create web pages that allow them to interface directly with end customers for the sake of information exchange and transactions. This virtual marketplace can be seen as existing on the line between the firm and the customer in Figure 5.

Dell is a classic example of a firm that interfaces with customers through the Web and fits the disintermediated model. The firm still relies on inputs from upstream sources, but it is able to create value from these inputs and deliver outputs directly to end customers. Another example of a company that uses disintermediation is Apple. Apple does not rely exclusively on distributors and retailers to reach its end customers. In fact, Apple has not only disintermediated in the virtual marketplace, but in the physical marketplace as well, by opening its own retail stores. Many companies, like Apple, complicate modeling the supply chain by not relying exclusively on either disintermediation or the traditional model, but on the use of both methods simultaneously. For the sake of the model in Figure 5, any remaining traditional distributors and retailers will not be considered.

Although disintermediation of the supply chain does not necessarily constitute a change in the way that the value chain activities are distributed (hence no change in the distribution shown in Figure 5), the way the value chain activities are handled is not without change. For example, a service activity in the value chain will probably inherit more responsibility due to the

exit of supply chain intermediaries who may have previously played a role in the process. The sales and marketing activities will also take on a different role as the firm starts interacting with customers directly and through new mediums such as the Web. The marketing effort might become more involved if the firm could previously rely on retailers to provide at least some form of awareness of its product. Finally, outbound logistics will be markedly different, considering the firm will be selling and delivering its products directly to customers. The firm, for example, will have to consider the best way to ship products to consumers once the Web enables customers around the world to order products.

Customersourcing

A final application to consider in the transformation of supply chain and value chain models is a type of crowdsourcing that is enabled by Web 2.0. This paper coins the term *customersourcing* as a subcategory of crowdsourcing wherein a community of customers contributes to a firm by performing its value chain activities and/or acting as its supplier. Customersourcing is also applicable when the contributor is not an actual customer but is a potential customer whose interests or characteristics are sufficiently aligned with those of actual customers. This happens when customers and suppliers exist within a common community, where certain preferences prevail and members are incentivized to reach common goals. Consider open source software as an example of this. Members of the open source software community are users and contributors alike, but all operate under a similar goal; the existence of software that provides the freedoms for the user to run it for any purpose, study it, redistribute it, and improve it (Durkovic et al., 2008).

Customersourcing is a subcategory of crowdsourcing that exists alongside other subcategories such as *intelligent sourcing*. Intelligent sourcing occurs when the firm sources from a crowd that is thought to be able to contribute more effectively than the general public. Dern (2011) explains it as such: “An intelligent crowd is a group of people who are specialists in a certain area, and are capable of producing work on-demand. As opposed to a ‘wisdom of the crowds’ method (which does not discriminate based on experience or specialty), intelligent crowds are composed of micro-specialists, and can complete specific aspects of a project at a higher quality.” Like in intelligent sourcing, customersourcing refines crowdsourcing to a pool of contributors who are able to provide more effective input than the general public.

Customersourcing exists largely because of disintermediation and the ability of businesses to interface directly with customers through the Internet, especially with Web 2.0 technologies. Increasingly, customers are playing a role within businesses that surpasses having needs and purchasing products (Von Hippel, 2005). Tredinnick (2006) argues that “as information proliferates, control is being gradually ceded to users, opening up the possibility of a new, more democratic, and more evaluative phase in the exploitation of information within organizations.” This is apparent in the supply chain model represented in Figure 6, in which value chain activities of the firm are distributed to customers. The value chain activities that customers take partial or full control of include operations, sales and marketing, service, and research and development.

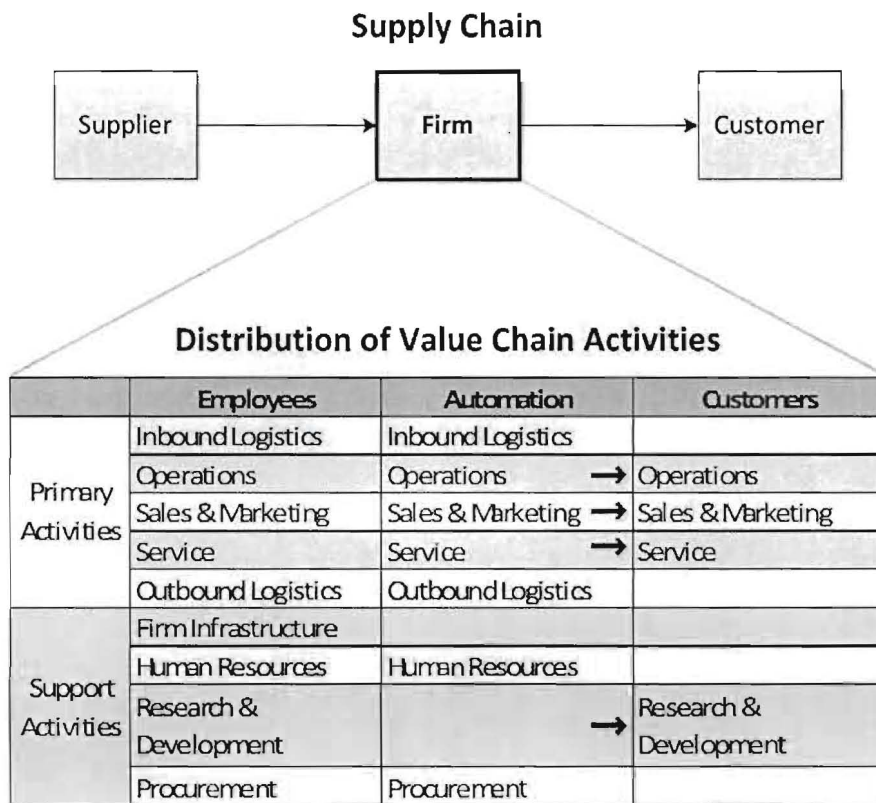


Figure 6: Supply Chain and Value Chain Models after Automation, Disintermediation, and Customersourcing of Value Chain Activities

One of the main benefits of customersourcing is that customers often know exactly what they want. A company that sources from its customers is able to “create a high variety of products without risk and without heavy investments in market research to access customer preferences before production starts” (Piller, 2010). This is because sourcing from customers has the advantages of: keeping feedback relevant to the business’ target market; obtaining information and ideas that are in line with the interests of the target market; and gaining valuable insight that can only be provided by users of a product. An example of this would be one that Von Hippel (2005) describes, in which lead users of mountain bikes played an active role in the innovation of bikes and biking technology. This type of sourcing was valuable because it provided accurate feedback regarding what customers were able to discover through use of the

product and their own needs, as opposed to postulations from non-customers who would likely have less accurate or less effective feedback for how to improve mountain bikes.

A firm using customersourcing might be able to redistribute several of its value chain activities to the customer, but will still require supply inputs from sources other than the customer. For example, a firm might find that it can outsource its research and development activities entirely to its customers, but it will still need to purchase the materials necessary to transform the customer-generated ideas into products. One customersourcing company that fits this description is Threadless. Threadless is an e-commerce business selling t-shirts with designs submitted by users of the website. Briefly, the way the business works is that members of Threadless' online community submit t-shirt designs that they have created to Threadless. The entire community then votes on the designs. The most popular designs are then printed on t-shirts and other merchandise and sold through the online store or in the company's only retail store. Threadless summarizes its model as, "Our community creates the most amazing designs on the planet. We print them on t-shirts and a bunch of other stuff" (Threadless, n.d.). In Threadless' case, customers play a key role in multiple activities of the firm's value chain. Ultimately, all products sold by Threadless are created, inspected, improved, approved, and selected by a user community before any larger investment is made into a new product (Piller, 2010). As depicted in Figure 6, firms like Threadless that use customersourcing can distribute virtually all of their research and development activities to the customers. Nonetheless, the firm still relies on the input from suppliers other than its customers for the materials to produce t-shirts and other merchandise.

The contributions that businesses receive from customers in the process of customersourcing do not just represent a potential change in the distribution of value chain

activities, but also a change in the structure of the supply chain. The movement of information or physical goods from customers to the firm represents a departure from traditional modeling and is depicted in Figure 7.

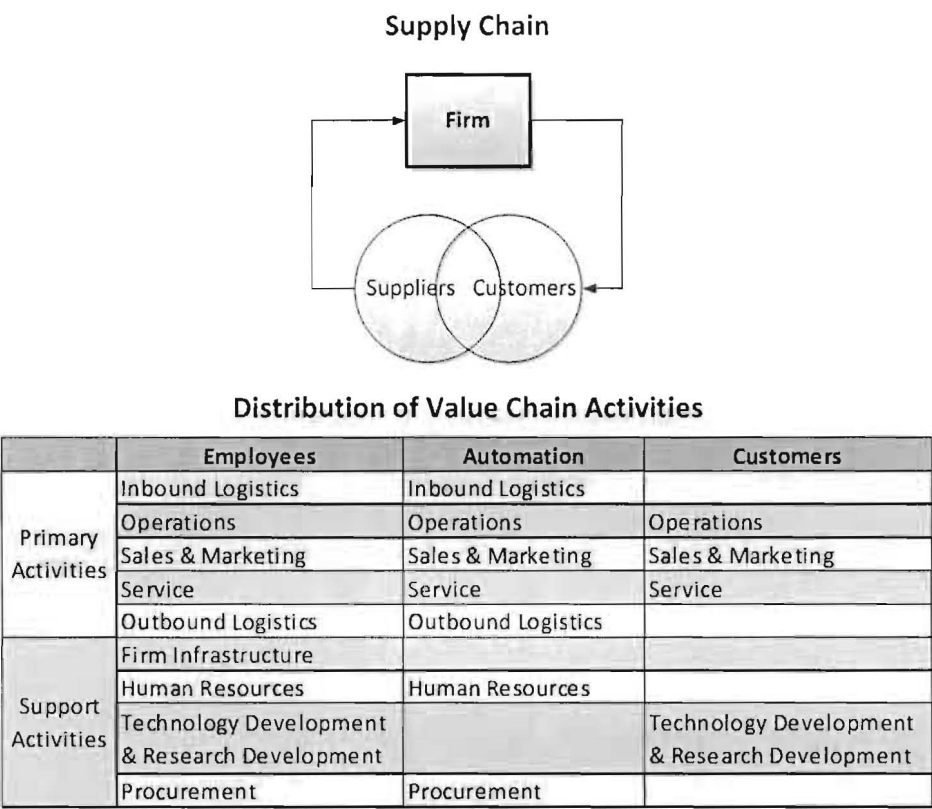


Figure 7: Supply Chain and Value Chain Models after Automation, Disintermediation, and Customersourcing of both Value Chain Activities and Supply

With customersourcing, the outer entities (supplier and customer) of the supply chain are bent inwards so that they overlap. The area in which the two entities converge represents a fluid population of people who may be customers and suppliers for the firm simultaneously. This type of a situation often exists when a firm uses the Web to set themselves up as host to a community of users. In this case, inputs from users (who are also suppliers), whether informational or physical, flow through the value chain activities of the firm, and are then redistributed to other community members (who are also customers). Not all entities in the supply chain are

simultaneously suppliers and users, but the community is a fluid mix of people who may at some point be suppliers, customers, or both at any given time. Even though some contributors are not current customers, customersourcing is still applicable due to their potential to be customers whose interests or characteristics are sufficiently aligned with those of actual customers.

Sourcing from a community comprised heavily of customers has benefits that set it apart from general crowdsourcing or not crowdsourcing at all. One benefit is that suppliers to this type of a model have a high incentive to contribute ideas that meet the demands of the firm's customers. The most obvious reason for this is because they are themselves a customer. Naturally, they have a higher interest in the value that they receive from the firm than non-customer supplier would. Interestingly, customers are willing to contribute to firms even when they are not directly benefited (Von Hippel, 2005). When customers contribute to activities such as product development, their incentive doesn't have to be monetary, as many innovators will freely reveal their information because of perceived benefits. These benefits include potential improvements to the innovation, enhancement of their reputation, positive network effects, and the benefits of being the first person to reveal an innovation (Von Hippel, 2005). Gamification of crowdsourcing (and by extension, customersourcing) has also been shown to motivate non-employees to contribute to firms. Duggan and Shoup (2013) define gamification as, "the use of game mechanics and rewards in a non-game setting to increase user engagement and drive desired user behaviors." In this way, customers are motivated to contribute to the company simply because it is enjoyable for them. Consider the example Fold.it, a computer game that, thanks to contributions from the people who play it, has helped unlock the structure of an AIDS-related enzyme that the scientific community had been unable to unlock for a decade (Peckham, 2011).

Sourcing from customers, as opposed to a general population, is also advantageous because of the intimate knowledge that customers' have of the demand side of the supply chain. Whether the incentive for contribution is intrinsic or extrinsic, it motivates the contributor to submit inputs that align with the interests of the firm's customers.

iStockphoto is an example of an e-commerce business that utilizes customersourcing. iStockphoto uses the market creator e-commerce model. The website is home to about 22,000 amateur photographers who upload their photos and sell them to other members for low prices (Howe, 2006). iStockPhoto is an example of customersourcing because it relies on customers to perform value chain activities and supply the firm with inputs. For example, although iStockphoto is a stock photo site, it does not need to employ any photographers. Other e-commerce businesses, such as Match.com, are similarly able to source parts of their value chain to their customers. The match-making website uses the community provider model, another e-commerce model that lends itself to customersourcing.

Match.com is an excellent example of pure customersourcing, given that only customers of the website are able to contribute inputs to the firm as suppliers. Customers must first pay a fee to become a member of the website. They then become the suppliers for the firm by supplying personal information and photographs of themselves. More specifically, they are supplying the information about themselves that other customers are willing to pay to acquire. In this way, the firm is able to profitably facilitate the exchange of information between customers of the Match.com community. The same concept holds for social media sites such as LinkedIn, whose existence relies upon the creation and consumption of user-created content. Even though the concepts for both businesses are similar, they illustrate that the revenue models for customersourcing sites can be completely different. LinkedIn uses a revenue model called

freemium, in which the majority of users use the service for free, but a portion of customers subscribes to premium services (Laudon, 2012), whereas Match.com uses a subscription service.

The value chain portion of Figure 7 shows that several different activities of the value chain can be distributed to customers. One of the activities that is distributed to customers is sales and marketing. One benefit of customersourcing the marketing function of a firm is that customers participating in companies such as Threadless, Match.com, and LinkedIn are incentivized to elicit new customers for the business. A reason for this is that they often have the potential to gain from an increased number of users in the community or platform. Again, this incentive could be intrinsic or extrinsic. Customers are often willing to use their own methods, such as social media and word of mouth, to market a firm.

Figure 7 also shows that service is a value chain activity capable of being customersourced. One benefit of having customers integrated into the supply chain and value chain of a firm is that they have intimate knowledge of the products or services that are being bought. This means that customers are able to handle many of the service functions that would traditionally be handled by employees or automation. For example, customers can create online forums and communities dedicated to providing help for customers or for furthering the development of the product. A great example of this is open source software.

In virtually all examples of customersourcing, businesses apply the Internet and Web 2.0 technologies to business processes in a way that elicits a beneficial contribution from customers. Customer contributions make business processes more efficient and more effective while redistributing value chain activities and changing the structure of the supply chain.

Future Direction

This paper examined the application of disruptive technologies to value chain and supply chain models at a conceptual level. Future work in this area could take a more quantitative approach to the topic, examining exactly how each transformation of the business model has altered specific business metrics. For example, this paper qualitatively argues that automation has moved work away from a firm's employees without any quantitative evidence of exactly how *much* work has been distributed or how much more efficiently the work is being done.

One of the pervasive concepts of this paper is that the application of disruptive technologies and the rise of customersourcing exist within the realm of e-commerce. Several different forms of e-commerce are discussed and ultimately all of them converge into one model. Future research might look into what role customersourcing plays in each e-business model respectively and present several distinct models. An additional consideration would be the difference in the employment of disruptive technologies and customersourcing between firms selling physical goods versus firms selling nonphysical goods.

The culminating model of this paper, Figure 7, presents the supply chain as a conceptually as a closed loop between the firm and its customers/suppliers. Future research could examine this relationship more thoroughly, especially within the context of open versus closed systems. This research might lend to an understanding of the degree to which the supply chain can actually become closed, and what implications this would have. For example, could businesses customersource to the point of having a perpetual and self-sustaining business model that is capable of adapting to and buffering itself from any outside systems? To further elaborate, research could explore application of advanced forms of software to this model, such

as artificial intelligence, with the aim of proposing a firm that exists perpetually within its supply chain model without employee involvement.

Conclusion

Many new e-commerce businesses have emerged from value chain automation, supply chain disintermediation, and customersourcing. These three processes are enabled by the application of disruptive technologies such as software, the Internet, and Web 2.0, to business processes

The application of disruptive technologies has had implications for both value chain models and supply chain models. The activities of the value chain have been distributed away from employees to automation and customers. The supply chain has been disintermediated, so that firms interface directly with their customers. Value chain redistribution and supply chain disintermediation have culminated with customers acting as suppliers for the firm, and performing the firm's value chain activities. This contribution from the customers is a subcategory of crowdsourcing, and has been coined *customersourcing*.

E-commerce businesses comprise the group of firms that have applied software, the Internet, and Web 2.0 to their business models. These types of models are in high demand because of their efficiency and responsiveness.

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